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EXAMINER	
ALEJANDRO, RAYMOND	
ART UNIT	**PAPER NUMBER**
1745	

DATE MAILED: 10/25/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

Office Action Summary	Application No. 09/847,605	Applicant(s) HALTINER ET AL.
	Examiner Raymond Alejandro	Art Unit 1745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 August 2004 and 10 September 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-29* is/are pending in the application.

4a) Of the above claim(s) *11-22* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10 and 23-29* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *08/10/04 (RCE)* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 08/10/04 and 09/10/04 has been entered.

This is in reply to the aforementioned RCE and its related amendment. The applicants have overcome the 35 USC 102 rejection and the 35 USC 103 rejections. However, the instant claims are newly rejected over art as presented hereinbelow and for the reasons of record. Thus, the claims are non-finally rejected again.

Specification

2. The amendment filed 08/10/04 and 09/10/04 is objected to under 35 U.S.C. 132 because it introduces new matter into the disclosure. 35 U.S.C. 132 states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: a) all the newly added paragraphs after the paragraph ending on line 27 of page 8 contain new matter; b) most of the newly added figures 5-18. While applicants have indicated that "*support for the amendment to the specification and newly added Figures 5-18 may be found in the specification as filed, for example, at page 7, lines 2-5, at page 7, lines 29-31, and page 8, lines 1-5...*", there is no support for certain newly added embodiments and configuration now intended by the applicants. For example, upon reviewing

the original specification the examiner simply found support for a general structure or configuration strictly commensurate to the original disclosure as follows: 1) "*...of different geometric configurations on the anode and cathode faces of the interconnect. For example, flow passages depth and pattern intricacy may be selected for each side, anode and cathode, providing optimum flow channel geometry for the different flow requirements*" (page 7, lines 2-5); 2) "*The geometry of the gas flow passages can be extremely detailed with fine features for optimizing anode gas flow, or features that vary across the interconnect to compensate for fuel gas concentration changes and temperature changes of the anode gas as it flows across the fuel cell. In a preferred embodiment, the anode gas flow passages 16 and cathode gas flow passages 22 (best shown in FIG. 4) are each configured with a distinct pattern and depth selected to optimize fuel and oxidant gas flow...*" (page 7, lines 29-31 and page 8, lines 1-5). Thus, nowhere in the original specification the examiner can find support for: a) the specific functions of the anode side and cathode designs; b) the particularly specific four (4) section arrangement of the gas flow passages (i.e. embodiment of Figures 5-9); c) the particularly specific seven (7) section arrangement of the gas flow passages (i.e. embodiment of Figures 10-17). Accordingly, applicant is respectfully requested to make appropriate amendments to the specification (i.e. drafted paragraphs and/or amended figures) fully commensurate in scope with the original specification because the examiner recognizes that applicants are entitled to do so; or else, please, provide specific reference(s) ([by citing original pages, paragraph and/or figures]) where such amendments can be found.

Applicant is required to cancel the new matter in the reply to this Office Action.

Drawings

3. The drawings are objected to because most of the newly added Figures 5-18 introduce new matter *(please refer to item 2 hereinabove for further details)*. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 1-9, 23-24, 28-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Badwal et al 6280868 in view of Ruhl et al 6361892.

The instant application is directed to an interconnect for fuel cell elements wherein the disclosed inventive concept comprises the particular flow passage configuration.

With respect to claims 1 and 23:

Badwal et al disclose an electrical interconnect device for a planar fuel cell having a solid oxide electrolyte, a cathode, and an anode (ABSTRACT); said interconnect containing substrate having fuel gas-flow channels one side and an oxidation-resistant coating on surfaces of the anode said adapted to contact the anode (ABSTRACT). The interconnects 20, 22 are identical with an array of gaseous fuel channels extending across the underside 26 and array of gaseous oxidant flow channels 28 extending across the top side 30 (col 5, lines 14-18). The interconnect device comprises a plate-like chromium containing substrate (col 3, lines 27-28); the interconnect should have a relatively high electrical conductivity (col 2, lines 15-17). *Thus, the substrate (single base) is conductive.* It is further disclosed the technique of etching the surface of the interconnect prior to application of the metal layer (col 4, lines 35-40). *Since the*

interconnect surface is treated by etching, it is thus considered that the interconnect per se is *<u>an etched interconnect or an etched structured</u>. Additionally, this provides <u>a unique and distinctive surface geometry</u> on both the anode and the cathode gas flow passages.*

With respect to the limitation of a unique geometry created by chemical machining, it is noted that Badwal et al disclose that the surface of the interconnect substrate may be treated by any one of several techniques including sputtering of the metals, electroplating of the metals, electroless plating of the metals, ion beam evaporation, physical vapour deposition, plasma spray and laser technique (COL 4, lines 25-34) as well as having the interconnect surface treated by etching, polishing/grinding, etc (COL 4, lines 35-38). <u>Thus, Badwal et al is teaching to chemically machining the surface of both the anode and cathode flow passages. It is further noted that each of the above-described chemical treatment would impart a unique geometry to the flow passages.</u> Furthermore, it is noted that such method limitation (i.e. by chemical machining) incorporated into a product claim does not patentable distinguish the product because what is given patentably consideration is the product itself and not the manner in which the product was made. Therefore, the patentability of a product is independent of how it was made.

It is further disclosed that by providing the gas flow channels on both sides, the interconnects 20, 22 may be used to form a fuel cell stack in which an identical fuel cell 12 overlies the interconnect 20 and another identical fuel cell 12 underlies the interconnect 22. Further identical interconnects may then be placed adjacent the opposite sides of the further fuel cells, and so forth to build up a fuel cell stack of the desired number of fuel cells (col 5, lines 21-30/col 1, lines 35-38). *<u>Thus, the anode and cathode gas flow passages have a geometry selected</u>*

to provide fuel and oxidant gas flow according to system operation. It is also disclosed that gas flow paths are provided between the interconnect and respective electrodes (col 1, lines 36-38). *Thus, the interconnect per se comprises gas flow channels which provides appropriate and satisfactory gas flow.*

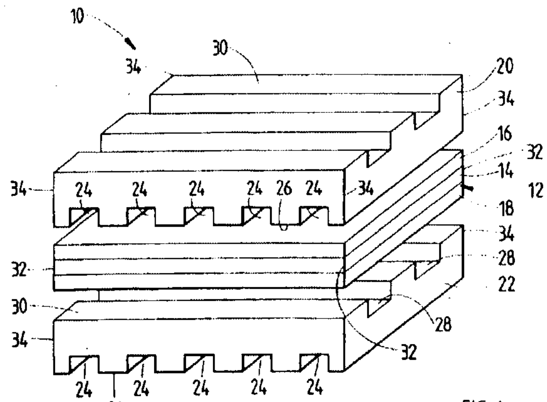


FIG 1

Figure 1 above illustrates a fuel cell assembly 10, the assembly comprises a fuel cell 12 comprising a solid oxide electrolyte central layer 14 with an anode layer 16 overlying one face of the electrolyte and a cathode layer 18 overlying the opposite face of the electrolyte. The fuel is sandwiched between a pair of interconnects 20, 22 which in use are in face contact with the anode 16 and cathode 18, respectively.

As for claim 2, 24:

Figure 1 above depicts interconnects 20, 22 comprising gas flow channels 24 and 28. As can be appreciated from Figure 1, the interconnect comprises a plurality of top side surfaces 30 and underside surfaces 26 closely spaced to each other which act as contact points between the interconnect and electrode and wherein said top side surfaces 30 and underside surfaces 26 have small dimensional diameters. *It is noted that the term "diameter" has been construed as the*

length of a straight line through the center of an object regardless of any specific geometric configuration.

As to claim 5, 24:

It is disclosed that gas flow paths are provided between the interconnect and respective electrodes (col 1, lines 36-38). *Thus, the interconnect per se comprises gas flow channels which provides appropriate and satisfactory gas flow.* It is disclosed that the purpose of the interconnect is to convey to convey heat away from fuel cells (col 5, lines 60-63/col 1, lines 11-16). The interconnect should have a relatively high thermal conductivity to provide improved uniformity of heat distribution (col 2, lines 19-21).

As to claim 8-9, 28-29:

It is further disclosed that the interconnect device has an oxidation-resistant coating on surfaces of the one side adapted to contact the anode (ABSTRACT/ Col 3, lines 25-35) wherein the coating comprises an outer oxygen barrier layer for electrically contacting the anode comprising Ni, a noble metal or an alloy thereof; and an electrically conductive metal barrier layer between the substrate and the outer layer (ABSTRACT/ Col 3, lines 25-35). *Thus, the electrically conductive metal barrier layer enhances electrical conductivity at the anode/interconnect interface; and the oxidation-resistant coating, in general, which is adapted to contact the anode conforms the surface of the interconnect to the fuel anode.*

Badwal et al disclose an electrical interconnect device for fuel cells as described above. However, the preceding prior art does not expressly disclose the varying cross-section and width configuration of the interconnect (separator); the specific contact point density, shape and diameter; and the specific flow passage depth and surface area.

As to claim 1:

Ruhl et al disclose one embodiment wherein at least one separator defines a micro-channel pattern (col 2, lines 57-59). Ruhl et al teach a separator 6 having defined therein channels 26 on either or both of its sides and providing reactant channeling (COL 6, lines 32-41). It is disclosed that it is possible to manufacture a pattern which desired lack of symmetry, to account for any expected side-to-side temperature difference within the stack wherein both the column shape and pattern layout may vary to produce the desired result (COL 7, lines 15-22). It is additionally disclosed that to compensate for the pressure drop of reactants, the next cross-sectional area of the channels 26 in each cell within the stack can be progressively increased; by increasing the net cross-sectional area, a generally even distribution of reactants across the stack height will result (COL 9, lines 45-53). It is further disclosed that to achieved a balanced distribution of reactants in other flow arrangements the cross-sectional area of channel may be varied according to the direction of the flow (COL 9, lines 54-60). It is disclosed that balanced flow distribution of reactants reduces thermal gradients within the cell; reactant depleted areas produce less heat than reactant rich areas, thus, uniform reactant supplies across the cell and stack reduce the thermal gradient (COL 9, line 65 to COL 10, line 3). It is further disclosed that, as can be appreciated, an almost infinite number of pattern configurations are possible (COL 10, lines 10-12).

> The pattern may be designed to achieve a specific overall pressure drop at its design gas flow rate. It is also possible to manufacture a pattern with a desired lack of symmetry, to account for any expected side-to-side temperature difference within the stack, for example. Both the column shape and pattern layout may vary to produce the desired result. While

In a stack with reactants being fed from the top, the pressure of reactants within the internal manifold will decrease progressively towards the bottom of the stack. To compensate for this decrease, the net cross-sectional area of the micro-channels **26** in each cell within the stack can be progressively increased from top to bottom. By increasing the net cross-sectional area from top to bottom, a generally even distribution of reactants across the stack height will result. To achieve a balanced distribution of reactants in other flow arrangements, for instance where fuel is fed from one end and oxygen bearing gas from the opposite end, the cross-sectional area of the micro-channels on the anode **12** and cathode **8** may be varied according to the direction of the flow. In a stack that receives fuel **22** from the bottom of the stack and oxygen bearing gas **24** from the top, the cross-sectional area of the cathode micro-channels in each cell would be increased from top to bottom, and the cross-sectional micro-channel area of the anode would be increased from bottom to top to balance the distribution of reactants across the stack.

Balanced flow distribution of reactants reduces thermal gradients within the cell **2**. Reactant depleted areas produce

10

less heat than reactant rich areas, thus, uniform reactant supplies across the cell **2** and stack reduce the thermal gradients.

As can be appreciated, an almost infinite number of pattern configurations are possible. It should further appre-

<u>With respect to claims 3-4:</u>

Ruhl et al disclose one embodiment wherein at least one separator defines a micro-channel pattern (col 2, lines 57-59) and/or the separator surface has a plurality of columns extending therefrom, said columns defining variable cross-section micro-channels therebetween (col 3, lines 16-20). It is disclosed that the separator contacts the surface of one of the electrodes opposite the electrolyte (col 2, lines 56-57). <u>*Thus, the separator acts as an interconnect.*</u>

Figure 2A below shows a separator 6 defining microchannels 26 on either or both of its surfaces. Since the separators contact the anode and cathode surfaces, microchannels 26 defined

within the separator surfaces provide reactant channeling (col 6, lines 33-40). A microchannel 26 may be defined by a quantity of regularly spaced circular columns 34 (*contact points*) extending between surfaces (col 6, lines 45-48). It is disclosed that it should be understood that a preferred pattern of columns 34 would utilize many more columns than shown, with each column having a diameter on the order of about 1 mm or less (col 6, lines 58-61/col 7, lines 48-52). The cell and stack diameters are typically about 50 to about 80 mm (col 5, lines 10-12). *The specific contact point density is apparent upon inspection of the separator plate 6 as illustrated in Figure 2A.*

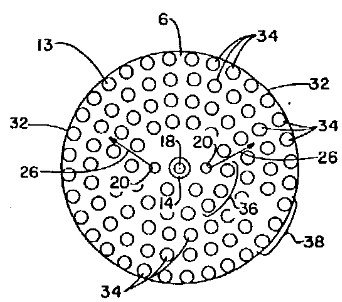


FIG.-2A

With respect to claims 6-7:

It is disclosed that the depth of the microchannels 26 may comprise substantially the entire thickness of the electrode 13 (col 6, lines 63-65). It is further disclosed that the depth of the micro-channel is generally on the order of about 0.1 to about 0.5 mm, although the micro-channel can be as deep as the thickness of the electrode layer. It is also disclosed that the crossflow channels in the separator has a depth "c" on the order of 1 mm (col 8, lines 53-67).

It is further disclosed that the height (h) of each column 34 is generally on the order of about 0.05 mm to about 0.4 mm (col 6, lines 61-63). The width of the micro-channel is generally on the order of about 0.1 to about 0.5 mm (col 8, lines 55-56). Thus, ***the specific surface area ratio between the flow passages surface area and the projected area*** is apparent based on the disclosed magnitudes of column diameter and height; and width and height of the channel.

Accordingly, *the surface area of a cylinder* (column or projected area) can be determined as follows: $A_{\text{surface cylinder}} = \mathbf{2\pi r^2 + 2\pi rh}$ (where r is the radio of the circular column and h is the column height); and the surface area of the flow channel can also be determined as follows: $A_{\text{surface rectangle}} = \textbf{height x width}$.

In light of these disclosures, it would have been obvious to one skilled in the art at the time the invention was made to use the specific varying cross-section and width configuration of the interconnect of Ruhl et al in the interconnect of Badwal et al because Ruhl et al clearly disclose that it is possible to manufacture a pattern which desired lack of symmetry, to account for any expected side-to-side temperature difference within the stack wherein both the column shape and pattern layout may vary to produce the desired result; to compensate for the pressure drop of reactants, the next cross-sectional area of the channels 26 in each cell within the stack can be progressively increased because by increasing the net cross-sectional area, a generally even distribution of reactants across the stack height will result. Thus, the specific varying cross-section and width configuration of the interconnect allows to achieve a balanced distribution of reactants in other flow arrangements, and hence the balanced flow distribution of reactants reduces thermal gradients within the cell because reactant depleted areas produce less heat than reactant rich areas, thus, uniform reactant supplies across the cell and stack reduce the thermal gradient. It is further contended that Ruhl et al further envision that an almost infinite number of pattern configurations are possible.

In view of the above, it would have been obvious to one skilled in the art at the time the invention was made to make the contact points on the interconnect of Badwal et al by having the specific contact point density, shape and diameter of Ruhl et al because Ruhl et al teach that flow

channel dimension, shape and contact percentage can be customized and controlled through the channel design for enhancing reactant distribution of the cell. Accordingly, those of ordinary skill in the art would find motivation to make <u>the specified contact point density</u> in the interconnect of Badwal as it is evident from Ruhl et al's teaching that a preferred pattern of columns would utilize many more columns than shown in the simplified figure (see col 6, lines 58-60). Thus, the preferred pattern may be designed to control flow distribution within a cell by defining pathways that offer reduced resistance in comparison with the surrounding material wherein the flow distribution may be further controlled by the number, size or arrangement of the micro-channels within the cell. The preferred pattern is designed with consideration to the column spacing and the contact area percentage. Further, those of ordinary skill in the art would find motivation to make <u>the specific contact point shape</u> in the interconnect of Badwal et al as Ruhl et al teaches that columns (contact point) of different geometries may be utilized to provide customized flow characteristics so that reactant gas flowing though the shaped channel achieves tailored local flow, pressure and velocity distributions. Moreover, those of ordinary skill in the art would have motivation to make <u>the specified contact point diameter</u> in the interconnect of Badwal et al as Ruhl et al disclose that the preferred pattern utilizes column having the specific diameter which help to minimize the cell pressure drop, to achieve a good gas velocity, thereby preventing the surrounding gas mixture from diffusion backward into the cell. Accordingly, the diameter of the columns and their contact area percentage would be selected as a compromise between minimizing electrical resistance, achieving good reactant gas distribution to and from the active electrode sites, achieving the target pressure drop with a minimum pattern thickness and fabrication limitations.

With respect to the specific flow passage depth and the surface area, it would have been obvious to one skilled in the art at the time the invention was made to make the interconnect of Badwal et al by having specified flow passage depth and surface area of Ruhl et al because Ruhl et al teaches that the specific depth of flow passage (channel) and surface area relationship should defines a channel pattern wherein the channel cross-section is enhanced such that reactant gas flowing through the passages (channel) achieves tailored local flow, pressure, and velocity distributions. Accordingly, those of ordinary skill in art would find motivation to make the specified flow passage depth and surface area relationship in the interconnect of Badwal et al as Ruhl et al teaches that such flow passage depth and surface area relationship (overall dimension), in general, achieve a specific target overall pressure drop that minimize electrical resistance and improves reactant gas distribution.

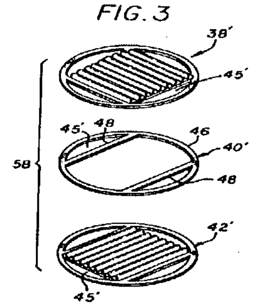
7. Claim 10 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Badwal et al 6280868 in view of Ruhl et al 6361892 as applied to claims 1 and 23 above, and further in view of Minh et al 5256499.

Badwal et al and Ruhl et al are applied, argued and incorporated herein for the reasons above. In addition, Badwal et al and Ruhl et al do not expressly disclose the specific manifolds comprising through passages arranged along outer perimeter of the interconnect.

Minh et al disclose manifolds of a solid oxide fuel cell which are integrally formed with the fuel cell's core; the fuel cell includes an interconnect wherein the interconnect is provided with cutouts that define manifold passageways for the fuel and oxidant (ABSTRACT). ***Figures 2D and 3*** show interconnects 38 and 38' having through passages along outer perimeters thereof

and one cell unit wherein through passages are aligned and matched to form an assembled fuel cell unit.

FIG. 3



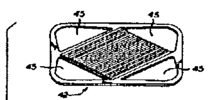


FIG. 2B

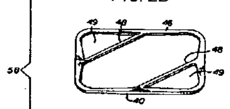


FIG. 2C

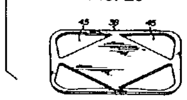


FIG. 2D

In view of these disclosures, it would have been obvious to one skilled in the art at the time the invention was made to make the specific manifolds comprising through passages arranged along outer perimeter of the interconnect of Badwal et al and Ruhl et al as taught by Minh et al as Minh et al teach that an interconnect design with integral gas manifolds is desirable because fuel cell core design with integral gas manifold minimize stringent tolerance requirements for stack hardware design. Accordingly, mechanical stability and structural integrity is improved by using the specific integral manifolding assembly of fuel cells having multiple, stacked individual cells. *It is further noted that Badwal et al's teaching also encompass fuel cell arrangements having either external or internal (integral) manifolding configuration.*

8. Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Badwal et al 6280868 in view of Ruhl et al 6361892 as applied to claim 23 above, and further in view of Hsu 6024859.

Badwal et al and Ruhl et al are applied, argued and incorporated herein for the reasons above.

Badwal et al also teach that an external manifolding arrangement as possible options for the gaseous fuel and oxidant (col 1, lines 47-49).

However, Badwal et al and Ruhl et al do not disclose the specific external stamped sheet metal manifolds.

Hsu discloses an electrochemical converter which is preferably a fuel cell such as a solid oxide fuel cell (col 6, lines 60-65); wherein the textured pattern of the top and bottom of the interconnector plate can be obtained by stamping metallic alloy sheets (col 10, lines 11-15) wherein the gas passages networks are formed and the manifolds is formed in the interconnector plate (col 10, lines 20-25).

In view of the above, it would have been obvious to one skilled in the art at the time the invention was made to make the specified external stamped sheet metal manifolds in the external manifolding of Badwal et al and Ruhl et al because Hsu teaches that stamped metallic alloy sheets can be used for manifolding purposes because the stamping method is capable of producing articles of varied and complex geometry while maintaining uniform material thickness. Thus, a suitable external stamped metal manifold having uniform material thickness and satisfactory geometry is obtained.

9. Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Badwal et al 6280868 in view of Ruhl et al 6361892 as applied to claim 23 above, and further in view of Fraioli 4510212.

Badwal et al and Ruhl et al are applied, argued and incorporated herein for the reasons above. However, Badwal et al and Ruhl et al do not disclose the interconnect being fused to the fuel cell.

Fraioli discloses solid oxide fuel cells (title) wherein all active core materials including the anode, the cathode, the electrolyte (the fuel cell components) and the interconnect are integrally fused together (Col 10, lines 21-25/Claims 2-3 and 12).

In view of the above, it would have been obvious to one skilled in the art at the time the invention was made to fuse the interconnect to the fuel cell of Badwal et al and Ruhl et al as taught by Fraioli as Fraioli teaches that fuel cell components including the anode, the cathode, the electrolyte and the interconnect are fused together to make a fuel cell core construction integrally joined or connected together. Thus, mechanical stability and structural integrity of the fuel cell structure is enhanced. Further, this fused structure would minimize the effects of differential thermal expansion across the surfaces of each fuel cell component constituting the entire fuel cell structure.

Response to Arguments

10. Applicant's arguments with respect to claims 1-10 and 23-29 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Raymond Alejandro whose telephone number is (571) 272-1282. The examiner can normally be reached on Monday-Thursday (8:00 am - 6:30 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Raymond Alejandro
Examiner
Art Unit 1745